SECTION IV. THEORY OF OPERATION

15.4.1 PSD FUNCTIONAL DESCRIPTION

The PSD is an intelligent software (firmware) device that manages RTA/ABT and ASOS/RTA communications. The messages sent and received to/from these units consist of hourly observations, specials, and SHEF's. The PSD uses asynchronous protocol and provides for bidirectional product transmissions and specific request/reply capability. The PSD also enables the ABT to receive spontaneous asynchronous routing products from the RTA. The following paragraphs describe the PSD traffic management scheme as well as the physical connections within the ACU and the pin-to-pin connections between the SIO board in the ACU and the connectors on the RTA and ABT, respectively. The PSD, acting as a transparent communications management task on the ACU, maintains the same protocols for RTA/ABT communications as if the RTA and ABT were connected directly to each other. The following paragraphs also describe the way in which the PSD manages ASOS/ RTA and RTA/ABT message traffic. The PSD DIAG function is utilized to monitor PSD messages (paragraph 15.5.3.2.3).

15.4.1.1 **PSD Message Traffic Management**. The message traffic between the PSD and ASOS, RTA, and ABT follows a particular sequence that depends on the origin of the message. The PSD acknowledges messages received from the RTA and ABT; however, messages received from ASOS are not acknowledged. The sequence of messages traveling over the PSD link is illustrated on figure 15.4.1 and described in the following paragraphs. Examples of message traffic are provided in Section V, following paragraph 15.5.3.2.5.

15.4.1.1.1 **ASOS/RTA Communications**. ASOS sends status messages, (e.g., METAR's and SHEF's) to the RTA via the PSD. The RTA acknowledges the receipt of messages from the PSD. After 2 minutes, ASOS sends a request to the RTA via the PSD for a copy of the last message sent. The RTA responds to the PSD with an acknowledgment. The RTA subsequently sends the message copy to the PSD and the PSD acknowledges receipt. The PSD then sends the copy to ASOS. ASOS compares the last message sent with the copy received and, if they are equal, treats the situation as an acknowledgment. ASOS does not acknowledge receipt of the copy to the PSD. When the PSD is communicating with the RTA (e.g., urgent specials), the PSD is also able to handle ABT to RTA communications, including multiple ABT to RTA requests and RTA to ABT replies. The PSD also handles ASOS/RTA communications when the ABT is disconnected or otherwise unavailable.

15.4.1.1.2 **RTA/ABT Communications**. All RTA/ABT communications are via the PSD and are grouped into the following generic message-types:

a. ABT to RTA data requests

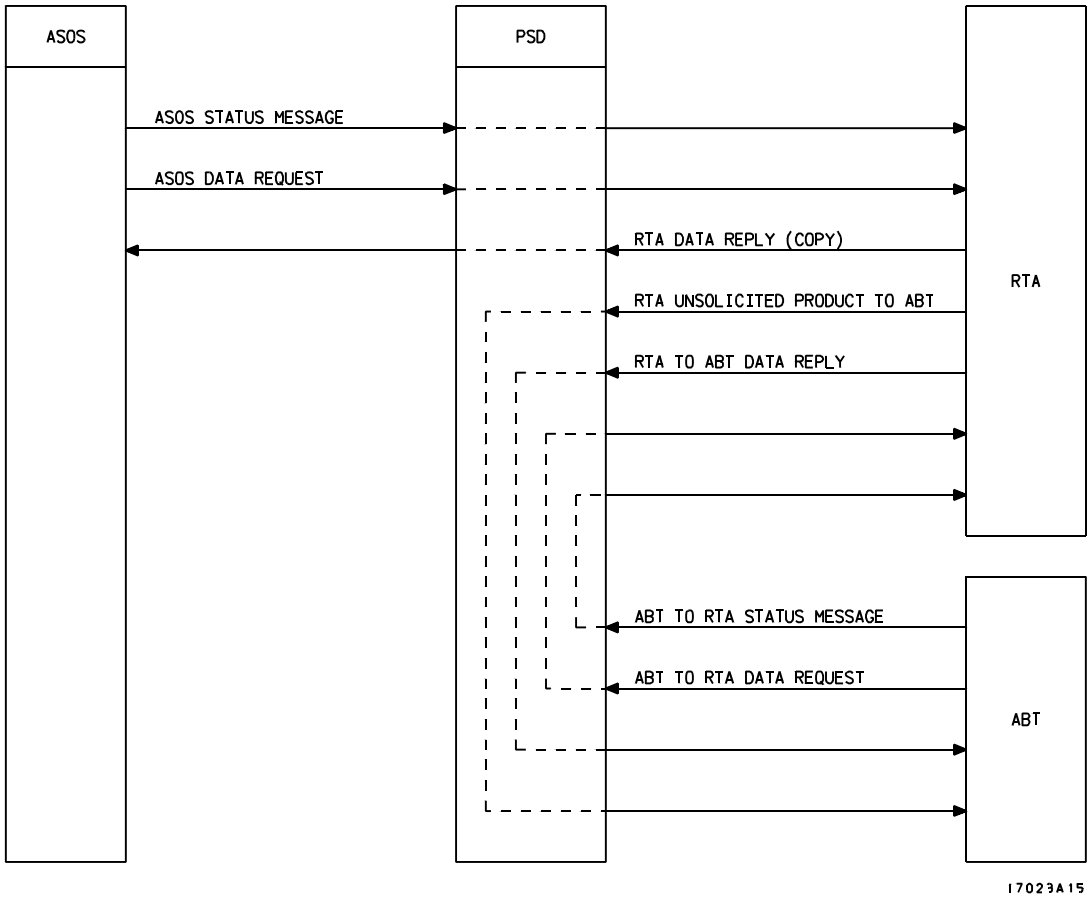
b. RTA to ABT replies

c. RTA unsolicited messages to the ABT

d. ABT to RTA unsolicited messages

When the PSD receives a data request from the ABT, the PSD forwards the request to the RTA, acknowledges receipt to the ABT, and receives an acknowledgment from the RTA. When the PSD receives a reply from the RTA, the PSD forwards the reply to the ABT, acknowledges receipt to the RTA, and

receives an acknowledgment from the ABT. When the PSD receives an unsolicited message (i.e., not in response to an ASOS or ABT request) from the RTA, the PSD forwards the message to the ABT, acknowledges the message from the RTA, and receives an acknowledgment from the ABT. When the PSD receives an unsolicited message from the ABT (i.e., not in response to an ASOS or RTA request), the PSD forwards the message to the RTA, acknowledges the message to the ABT, and receives an acknowledgment from the RTA. The order in which the PSD retransmits and acknowledges messages may be affected by the instantaneous volume of message traffic (including ASOS/RTA traffic). In order to maintain uninterrupted communications, particularly when handling long messages, the PSD maintains sufficient queues (normally 64 KB, which is four times the maximum product size for each port). If either the RTA or the ABT rejects products (indicated by a negative acknowledgment), the PSD continues to transmit the product until it is acknowledged or until the PSD buffer is 80 percent exhausted, at which time the PSD on a first in first out (FIFO) basis attempts to transmit the next product for the port. This routine permits the PSD to accommodate the ABT off or disconnected condition without relying on control signals from the ABT. The PSD shares transmissions to the RTA between ASOS and the ABT on a reciprocal basis. At the end of each block transmission (including the acknowledgment), the other user (either ABT or ASOS) has an equal opportunity to send. The PSD accomplishes the ASOS RTA port sharing via a FIFO store-and-forward queue to which products received from ASOS or the ABT are appended. The PSD, RTA, and ABT retransmit unacknowledged messages at approximately 5-second intervals.



NOTE: ACKNOWLEDGMENTS ARE NOT SHOWN. THE PSD ACKNOWLEDGES ALL RTA AND ABT MESSAGES, BUT DOES NOT ACKNOWLEDGE MESSAGE FROM ASOS.

Figure 15.4.1. PSD Message Traffic

15.4.1.1.3 **PSD Connectivity**. Figure 15.4.2 illustrates the physical connection of the ACU components used to accomplish the PSD function. Figure 15.4.3 illustrates the end-to-end connection between the SIO board pins in the ACU and the pins on the RTA and ABT connectors. The port/pin assignments of SIO boards 4 through 8 are also identified in Chapter 2, Section IV. The particular physical connection between the RTA and/or ABT and the PSD depends on whether the RTA and ABT are remote from the ACU. If the RTA and ABT are remote from the ACU, the connection to each unit is via a leased line with the appropriate modem installed in the ACU modem rack. The PSD is transparent to the RTA or ABT and processes RTA/ABT messages in either direction using the same signals on the same pins as if the RTA and ABT were communicating directly. The PSD communicates with the RTA and ABT using RS-232C level signaling, which terminates in 25-pin D-type connectors. The RTA and ABT are equipped with modular Telco adapters, however, so that the units are connected to the ACU using 8-wire telephone cables with Telco adapters.

NOTE

The PSD programs CTS and DTR HI on its ABT connector so that transmissions for the ABT are not interrupted.

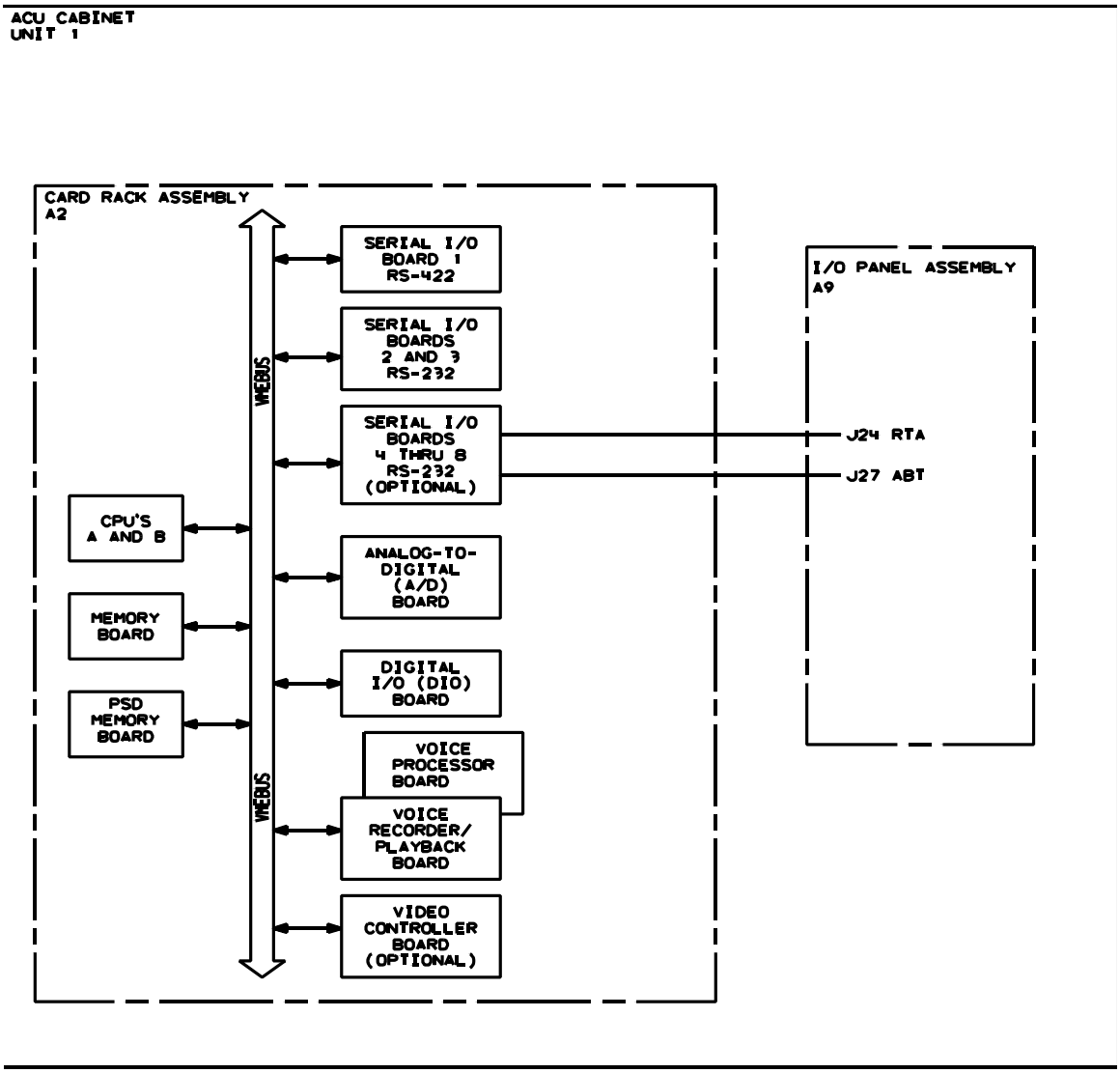


Figure 15.4.2. PSD Hardware Connectivity Within the ACU

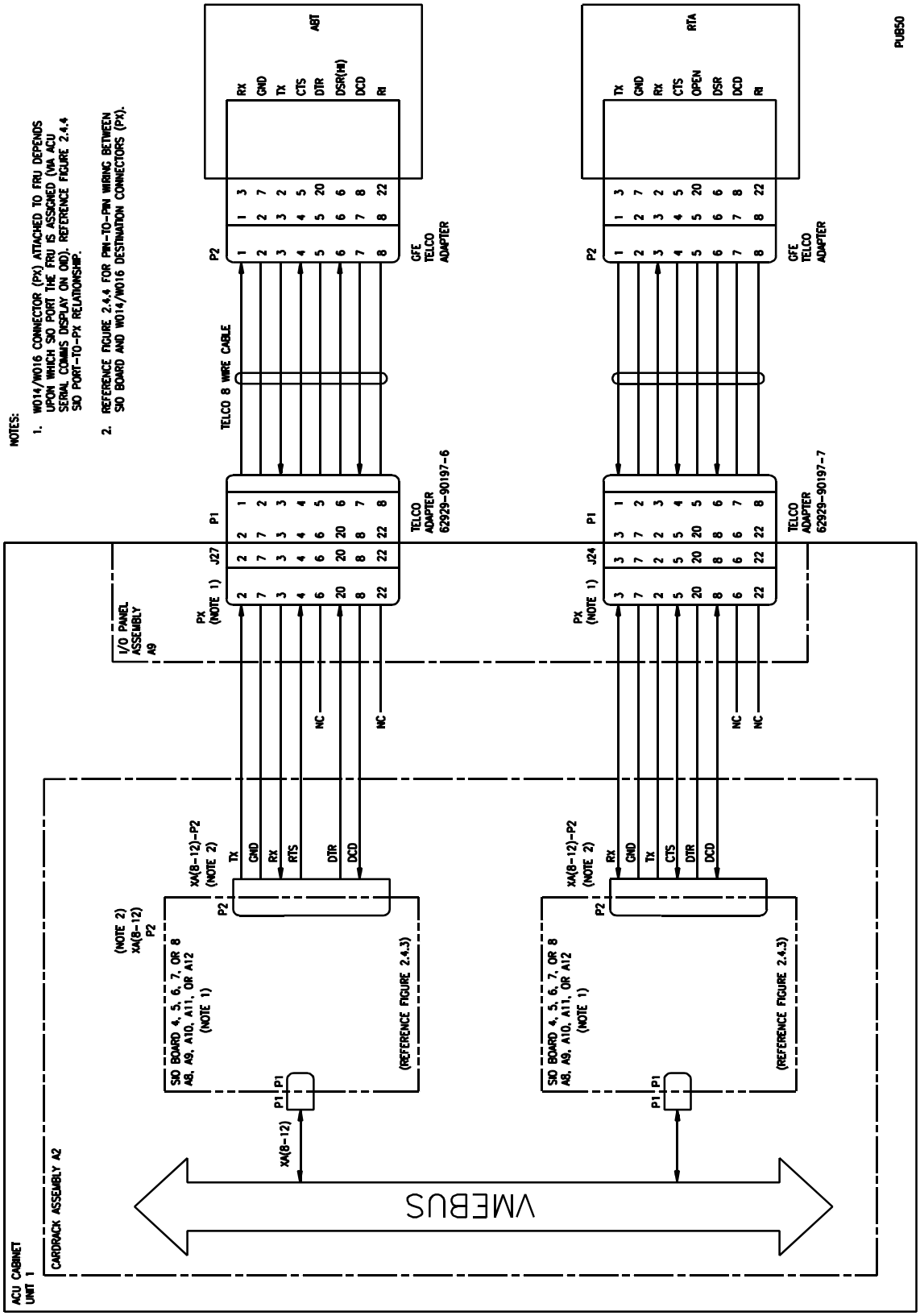


Figure 15.4.3. RTA and ABT to PSD Physical Connections